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Prediction of Lean in the Round Using Ultrasound Measurements

Abstract

Real-time ultrasound (RTU) images were collected on 170 Angus sired steers. These steers had routine carcass data collected, as well as lean mass weights after round fabrication. Lean weight in the round was determined by adding the peeled knuckle, inside round, and outside round weights together. There were four significant independent variables ($P < .05$) used to predict lean in the round from live measurements. They were: live weight (WT), ultrasound fat thickness between the 12th and 13th ribs (UFT), ultrasound ribeye area between the 12th and 13th ribs (UREA), and gluteus medius lean depth (GM).

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Prediction of Lean in the Round Using Ultrasound Measurements

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Summary

Real-time ultrasound (RTU) images were collected on 170 Angus sired steers. These steers had routine carcass data collected, as well as lean mass weights after round fabrication. Lean weight in the round was determined by adding the peeled knuckle, inside round, and outside round weights together. There were four significant independent variables ($P < .05$) used to predict lean in the round from live measurements. They were: live weight (WT), ultrasound fat thickness between the 12th and 13th ribs (UFT), ultrasound ribeye area between the 12th and 13th ribs (UREA), and gluteus medius lean depth (GM).

Introduction

Many of today's value-based marketing grids are based on quality and yield grade. Yield grade is a predictor of retail product yield in the carcass. Carcass weight, fat cover, ribeye area, and percent kidney, pelvic, and heart fat are the factors used in the USDA yield grade equation to predict retail product. Live weight, fat cover, and ribeye area can also be used to predict retail product in live cattle. Research has shown that fat cover accounts for the largest percentage of the variation in predicting percent retail product. Ribeye area is the measurement used to predict the amount of muscle in the carcass but accounts for only a small amount of the variation in retail product prediction equations. Therefore, it would be beneficial to find an additional measurement to improve the prediction of muscle mass or retail product in the carcass. Other research has indicated that the weight of the round, a large muscle mass, when added to the retail yield prediction equation increases the accuracy.

There is interest in determining if a linear measurement, gluteus medius muscle depth, would increase the accuracy of retail product prediction equations. The purpose of this study was to look at the prediction of lean in the carcass using live measurements.

Materials and Methods

Source of Data

Data for this study were obtained from Angus steers ($n = 170$) that were on feed at the Iowa State University

Ruminant Nutrition Farm. The steers were part of a nutritional study comparing specialty corn (high oil and/or high protein) vs. traditional corn used in finishing rations. The cattle were divided into 5 slaughter groups as determined by the nutritional study. RTU images were collected within one week prior to slaughter using an Aloka 500V equipped with a 3.5 MHz 17 cm linear array transducer. Centralized Ultrasound Processing (CUP) lab personnel then interpreted the images. Live animal measurements taken were WT, UFT, UREA, GM, and ultrasound rump fat depth (RUMP). Measurements for RUMP and GM were taken from the same image in an attempt to acquire more information with only one additional image taken chuteside. This image was collected in two positions over the rump: 1) above an assumed line connecting the hook and pin bones (HIPOS), and 2) below an assumed line connecting the hook and pin bones (LOPOS).

Routine carcass measurements were collected at O'Neil Pack, Omaha, NE, approximately 48 hours post mortem by the Precision Beef Alliance carcass data team. Carcass measurements included carcass weight, 12th rib carcass fat thickness, 12th rib carcass ribeye area, and percentage kidney, pelvic and heart fat.

The carcasses were then transported to a fabrication site, Jim's Wholesale Meats, Harlan, IA. Raw round weight (RAWRND) was taken after separation of the loin from the round. Other weights collected were fat-free peeled knuckle (KNUCK), inside round (INSRND), and outside round (OUTRND). KNUCK, INSRND, and OUTRND were added together to determine total lean in the round (TOTLEAN).

Data Analysis

A prediction equation for TOTLEAN was developed using PROC GLM (SAS), based on live animal measurements. Variables that were not significant ($P > .05$) were removed from the model.

Results and Discussion

After interpretation by CUP personnel, it was determined that HIPOS was a suitable location to obtain images for this analysis. This image is also easy to collect chuteside. Interpretation in the lab is also easy because of the definable landmarks (Figure 1). Furthermore, there was a higher correlation between two independent measurements taken at the HIPOS, than between the two independent measurements taken at the LOPOS. Only measurements from the HIPOS were used in this analysis in as much as this position could become the protocol for CUP interpretation. After the PROC GLM analysis for

TOTLEAN prediction, there were four independent variables that were Type III significant ($P < .05$), WT, UFT, UREA, and GM (Table 1).

The data for this study were collected on market ready steers (which are more physiologically mature than genetically similar yearling bulls) that could benefit from live animal measurements to predict retail product. The steers on the average were heavier, fatter, and heavier muscled compared with the 25,725 Angus bulls that were processed through CUP in 1998-1999 (Table 2). As additional data are collected that are more similar to yearling Angus bulls, there may be a rearrangement of the independent variables and their importance in the prediction of lean in the round.

Implications

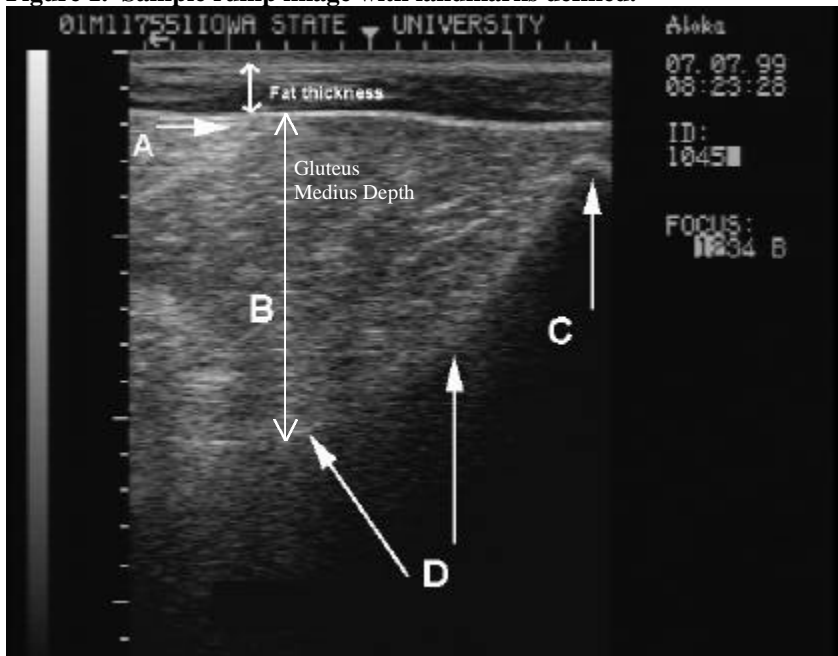
The inclusion of GM could help to increase the prediction of retail product based on live animal

ultrasound measurements. The assignment of a predicted retail product value to a bull that is processed through CUP would be very instrumental in establishing applicable retail product EPDs for Angus producers to incorporate into their selection procedures. It seems that added information can be obtained for these predictions from images that are already being collected by CUP field technicians, with slight modification.

Acknowledgments

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Figure 1. Sample rump image with landmarks defined.



- A – Apex of the biceps femoris, indicating the reference point for measurement of RUMP and GM.
- B – Gluteus medius muscle.
- C – Hip (hook) bone, this is where the anterior end of the pelvic bone rises to the point of the hip (hook) bone.
- D – Interface between the bottom of the gluteus medius and the pelvic bone.

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Table 1. Independent variables for the prediction of total lean in the round.

Variable	Partial R ²	Model R ²	P-Value
WT, lbs.	0.6871	0.6871	0.0001
UFT, in.	0.0253	0.7124	0.0002
UREA, in. ²	0.0265	0.7389	0.0001
GM, in.	0.0078	0.7467	0.0257

Table 2. Comparison of steers in a lean-in-the-round study vs. Angus bulls processed through CUP.

Variable	Steers Mean ± S D	365 day Adjusted Angus Bulls Mean ± S D
WT, lbs.	1208 ± 92	1070 ± 113
UFT, in.	0.57 ± 0.15	0.24 ± 0.10
UREA, in. ²	13.46 ± 1.04	11.71 ± 1.44
RUMP, in.	0.51 ± 0.15	0.28 ± 0.10
GM, in.	3.76 ± 0.35	N/A